

University of Rhode Island
College of Human Science and Services
School of Education

EDC 430 Methods and Materials in Secondary Teaching and Practicum Experience for Secondary Mathematics Education

EDC 431 Clinical Experiences in Secondary Education III

MTH 391 – Special Problems (independent study)

Fall 2015

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Office Hours: T 1:00 – 3:30 and by appointment

Class location: Chafee 251

EDC 430 - 3 credits, EDC 431 - 1 credit, MTH 391 – 1 credit

Office: Chafee 709

Office phone: 874-4149

Secretary: Ms. Marsha Mott 874-4068

Meets: Tuesday 3:30 – 6:15 pm

Course Information

Catalog Description:

EDC 430-Principles of education as related to curricular materials and classroom situations. Sectioned by academic major: English, mathematics, modern language, science, social studies. Not for graduate credit in education. (3 credits.)

EDC 431-Secondary school clinical experience, taken concurrently with secondary methods course (430) during the semester prior to student teaching. Candidate applies content learned in methods course and prior coursework to peer teaching and classroom settings. Not for graduate credit in education. (1 credit.)

MTH 391-Special Problems (independent study)

Prerequisites: EDC 102 and EDC 250 and senior standing or permission of instructor. Concurrent enrollment in EDC 430 and 431 required. Open only to secondary education majors and secondary MA/TCP students.

Relationship to Professional Preparation:

EDC 430, EDC 431, and MTH 391 are an important part in your transition from URI student to professional teacher; therefore, the lessons learned and the collegial relationships made in these courses will not only pay off for a grade in them, but also serve you well in your future as a Secondary Mathematics teacher. In EDC 430 you learn about HOW to teach, in MTH 391 about WHAT to teach, and in EDC 431 you begin to learn to implement this knowledge in PRACTICE and REFLECT on your learning. Key requirements in these courses include *investigating and evaluating* secondary mathematics curriculum materials and maps, *planning* and *implementing* lesson plans, *reflecting* on your work and practice, *professional involvement* in your student teaching classroom(s), *membership* in one or more professional associations, submission of evidence of your content knowledge in a *Mathematics Portfolio*, and the successful completion of a *Unit Plan*.

In order to earn a "recommendation to student teach" teacher candidates must:

1. Earn a "meet or exceed" designation for each criteria of the unit plan assignment and successfully upload this assignment to the TaskStream E-folio system (<http://www.taskstream.com>);
2. Earn a "recommendation to student teach" from both the cooperating teacher and the university supervisor in pre-student teaching practicum evaluation(s);
3. Address any areas in need of improvement if "recommendation with reservations" is noted by the university supervisor and/or cooperating teacher(s);

4. Complete all other program requirements (including earning an overall GPA of 2.5+, 2.5+ in Education, and 2.5+ in Mathematics coursework, complete a TB test and BCI (criminal background check);
5. Show evidence of a passing score on the Praxis II: Principles of Learning and Teaching test prior to the last day of the fall semester;
6. Show evidence of a passing score on the Praxis II: Mathematics Content Knowledge test prior to the last day of the fall semester;
7. Obtain a RI State Student Teaching Certificate;
8. Earn an "S" in EDC 431 from the university supervisor in the final evaluation;
9. Submit and complete all course assignments (EDC 430/431 and MTH 391) and the Pre-Student Teaching Checklist and Log (signed by the cooperating teacher);
10. Earn a C or higher in EDC 430 and MTH 391; and
11. "Meet or exceed" all criteria, including each NCTM teaching standards and RIPTS standards, on the performance-based Unit Plan

Course Texts and Materials

Nearly all handouts and materials for the course will be available electronically only via the following wikispace: <http://edc430-03.wikispaces.com>

Support for student teaching and related documents and materials will be posted on the following wikispace: <http://secondary-mathematics-uri.wikispaces.com/TURISME+Home>

Required Texts:

1. Chazan, Daniel (2000). *Beyond formulas in mathematics and teaching*. New York, New York: Teachers College Press. Available at <http://store.tcpress.com/0807739189.shtml> or <http://www.amazon.com/Beyond-Formulas-Mathematics-Teaching-Classroom/dp/0807739189>
2. Current membership in a professional association (NCTM or your state's organization, e.g. RIMTA in RI). Acceptable evidence of membership can be provided in the form of a photocopy of a membership card or a photocopy of the journal cover with your address label or an e-mail confirmation notice. *This evidence is due by midterm*. Please note that a reduced rate student membership is available from the National Council of Teachers of Mathematics. Information will be provided in class although you may want to visit the professional association online at <http://www.nctm.org/Membership/Membership-Options-for-Individuals/> (Student e-membership of NCTM: \$45 with electronic subscription to either Mathematics Teaching in the Middle School or the Mathematics Teacher). If you decide to become an NCTM member, please mention that you were referred by me and list my Member Number 3860058. Student Membership (\$15) in the Rhode Island Mathematics Teachers Association (RIMTA) <https://sites.google.com/site/rimtamath/home/membership>.

Suggested Texts:

1. Posamentier, Alfred S., and Jay Stepelman (2005). *Teaching Secondary Mathematics*. Pearson Education.
2. Rubenstein, Rheta N., Charlene E. Beckman, and Desisse R. Thompson (2004). *Teaching and learning middle grades mathematics*. Emeryville, CA: Key Curriculum Press.
3. Artzt, Alice F., and Eleanor Armour-Thomas (2002). *Becoming a reflective mathematics teacher: A guide for observations and self-assessment*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

4. Posamentier, Alfred S., and Herbert A. Hauptman (2006). *101+ Great ideas for introducing key concepts in mathematics: A resource for secondary school teachers*. Corwin Press.
5. Posamentier, Alfred S., (2003). *Math Wonders to Inspire Teachers and Students*. Association for Supervision and Curriculum Development.
6. Secada, Walter G., Elizabeth Fennema, and Lisa Byrd Adajian, Eds., (1995). *New directions for equity in mathematics education*. New York, NY: Cambridge University Press.
7. Ascher, Marcia (2002). *Mathematics elsewhere: An exploration of ideas across cultures*. Princeton, NJ: Princeton University Press.
8. Moses, Robert P., and Charles E. Cobb, Jr. (2001). *Radical equations: Math, literacy, and civil rights*. Boston, Mass: Beacon Press.

Materials:

- A free account with www.evernote.com
- A free account with www.educrations.com
- Graphing Calculator or graphing calculator app. In the course, I will mostly use the TI-84+.
- Recommended: The student version of the Geometer's Sketchpad version 5 (www.keymath.com/x18112.xml), \$29.95. You may also be interested in a free app: JavaSketchPad at http://www.dynamicgeometry.com/JavaSketchpad/Download_Center.html
There is also a piece of on-line free software called Geogebra. You can find this at: <http://www.geogebra.org/cms/> Geogebra is also available as a free app for the iPad.
- In addition, I recommend a ruler, protractor, and two differently colored pens or pencils.

Measurable Course Outcomes

Grounded in the University of Rhode Island, School of Education's conceptual framework that is based on the Rhode Island Professional Teacher Standards (RIPTS) and based on current professional standards for professional secondary teachers of mathematics, the following course objectives will be demonstrated by all successful teacher candidates (see next page):

EDC 430 Assignments	Outcomes	Points	NCTM	RIPTS
Active participation, ongoing professionalism in and out of class (includes membership in professional association)	Practice professional practices of teachers.	10	7 8.5, 8.6	10, 11
Reading Journal	Keep a record of your thoughts and feelings during the reading of the assigned book	10	1-10	10.2, 10.3
Unit Plan	Plan a series of cohesive, well-developed lessons.	30	1-15	1-5 6.1, 6.2, 6.3, 6.4 7-9
Lesson Plan: Addressing the needs of all students through inquiry.	Plan and implement (if possible) Inquiry-based Lesson(s). Demonstrate knowledge of diversity and differentiation of instruction, including the use of concrete materials and/or models.	10	8.6, 8.7, 8.8, 16.1, 16.3	1-3 4.1, 4.2, 4.4 5 6.3, 6.4, 6.5, 6.6 8 9.2, 9.5 10.3
Lesson Plan: Teaching with Technology	Plan and implement (if possible) lesson(s) where students use technology (e.g. graphing calculators, calculator based laboratories, Internet or iOS applets, Internet or iOS simulations).	10	8.9, 16.1, 16.3	1-3 5 6.3, 6.4, 6.5, 6.6 8 9.2, 9.5 10.3
NCTM Content Portfolio	Demonstrate your growth in the NCTM content standards by constructing a portfolio of selected best work.	10	9-15	2.1-2.5
Syllabus for Student Teaching	Demonstrate ability to plan, collaborate, and communicate effectively with cooperating teacher and students.	20	16	1 7 9.1 10.1
Letter grade for 3 credits		100		

EDC 431 Assignments	Outcomes	Points	NCTM	RIPTS
Participation, professionalism in and out of class (includes completion of 40+ hours of practicum experience. For high school only=40+ hours; for middle and high school 20+ hours at each setting)	Practice professional practices of teachers.	40	16.1	1.3 10 11
TaskStream Assessments (Including NCTM math content portfolio)	Become familiar with and prepare Taskstream E-folio Assessments.	20	1-16	6
Maintain a Reflective Field Log	Systematically reflect on teaching experiences to inform practice.	30	8	1.3 9.5 10
Cooperating teacher(s) and university supervisor's recommendation to student teach	Demonstrate each of the RIPTS and NCTM standards at an acceptable level.	10	1-16	1-11
S or U grade for 1 credit and permission to student teach		100		

MTH 391 Assignments	Outcomes	Points	NCTM	RIPTS
School Report of Curriculum Organization and materials	Learn the school curriculum for at least one course or grade at the practicum school.	30	8.1-8.2	2
Audit of Middle School or High School mathematics text series.	Learning to evaluate evidence in text series and make instructional decisions regarding mathematics text materials	70	8.1-8.2	2
Letter grade for 1 credit		100		

Course and Practicum guidelines:

1. Plan to attend all classes and practicum sessions. This course is a part of your professional preparation to teach, and as such, should be of the highest priority.
2. Part of being a professional teacher is *punctuality, attention to detail, and good communication*. Class meetings will consist of a lecture/laboratory format in which you will be expected to actively engage in all activities with your fellow teacher candidates. Much of what will occur during class meetings is the practicing of methods used for mathematics instruction. Because of this interactive character, it is very difficult to make up for missed classes. **Your attendance is a vital component of this course.** If you must be absent for class, please contact me prior to your absence or as soon possible based on the circumstance. It is my discretion to assess point deductions for absence (up to 5 points per absence) even when an absence is excused, although your professional communication and previous attendance and participation in class will be factored into my decision. Your attendance and engagement in class and practicum are an indicator of your readiness to student teach in the Spring 2016 semester and will be observed as part of my recommendation for you to student teach. Missing three or more classes severely diminishes your readiness for student teaching and may be grounds for failure of the course. Good communication can prevent a lot of difficulty in this area.
3. If you must be absent for practicum, you **MUST** contact your teacher directly, or if this is not possible, contact the school secretary with an urgent message before your absence. Next, please email me or call me to note your absence from practicum. If you were expected to teach a lesson, you must provide lesson plans to your teacher prior to your absence. You should plan to make up the missed practicum session as soon as possible.
4. See the URI inclement weather policy for information about cancelled classes at URI. Listen to local radio or TV station announcements about school closings/delays for your student teaching placement. Many Radio stations also update delays and closings on their websites.
5. Be professional! The way you present yourself in class and at your student teaching placement(s) is a key way you demonstrate RIPTS standards 10 and 11. This includes your use of mobile devices. **Remember that you do not just represent yourself in the school(s). You represent URI and the mathematics education program. Your disposition paves the way for future students in the program. It can, of course, also close doors.**

Revision policy:

Each of the lesson plans and your unit plan can be revised for a possible grade change (including meeting and exceeding each criterion) if the following guidelines are followed:

1. Revised work is submitted no more than 1 week after instructor's written feedback is received (unless otherwise agreed). Late work will not be considered.
2. Professional responsibility and initiative are taken for the revision of the work (e.g., read and reflect upon instructor feedback and conference with instructor).
3. Revision is submitted with new work as **well as original work and instructor's rubric rating**. I will not reconsider a re-assessment without all original materials.
4. Revision is original work of student.
5. No portion of the work has been submitted to another course for a grade or instructor feedback.

Please note that I will be happy to provide you feedback on work in progress before it is due.

Reasonable Accommodations: If you have a documented disability that may require individual accommodations, please make an appointment with me prior to the third class meeting and provide written documentation about your documented learning difference. We will discuss how to meet your individual learning needs to ensure your full participation in the course and to ensure fair and equitable assessment procedures. For further information or assistance, contact the staff at Disabilities Services for Students (Office of Student Life), 330 Memorial Union -874-2098.

Respect for health, safety, and rights of self and others:

The University of Rhode Island expects its students to treat other persons with respect and human dignity. All members of the community share the responsibility for protecting and maintaining community health, safety, and the rights of other persons. (Source: URI Student Handbook 2005-2007)

Course Schedule, Topics, and Assignments

Date	Topic	Assignment Due
9/15	Course and people introductions Building a conceptual wall Standards (Common Core) Testing: NECAP/PARCC	Blue: MTH 391 Orange: EDC 430 Green: EDC 431
9/22 9/23: MTH 391	Inquiry-based Learning and Teaching: Launch Explore Summarize methodology Discuss Chapter 1 Chazan	Read Chazan: Coda (pp. 165-166), and then Introduction (xi-xvi), and Chapter 1 (pp. 1-36). Due: Reading Journal Entry 0
9/29 9/30: MTH 391	Learning and Teaching Algebra Brainstorming the Unit Plan	Read: NCTM algebra standard; CCSSM for algebra. Due: Reading Journal Entry 1
10/6 10/7: MTH 391	Using technology and concrete materials to teach Algebra Discuss Chapter 2 Chazan	Read Chazan: Chapter 2 (pp. 37 -58) Due: First Field Reflection
10/13 10/14: MTH391	Learning and Teaching Geometry: the Van Hiele levels of geometric thinking	Due: Inquiry Lesson Plan Due: Reading Journal Entry 2
10/20 10/21: MTH 391	Using technology and concrete materials to teach Geometry Discuss Chazan Chapter 3	Read Chazan: Chapter 3 (pp. 59 -111) Due: School Curriculum Report
10/27 10/28: MTH 391	Mini Lessons	Each of you will present your Inquiry lesson plan as a 30” mini-lesson to a group. Due: Reading Journal Entry 3
11/3	The connections between teaching Algebra and Geometry; Trigonometry	Due: Second Field Reflection Due: Unit Plan Outline
11/10 11/11: MTH 391	The connections between teaching Algebra and Geometry; Trigonometry Discuss Chazan Chapter 4	Read Chazan: Chapter 4 (pp. 112-147)
11/ 17	Number and Operations: fractions, decimals and percents; rate and ratio	Due: Curriculum Audit
11/18	Number and Operations: fractions, decimals and percents; rate and ratio Discuss Chazan Chapter 5	Read Chazan: Chapter 5 (pp. 148-164)
11/24	Data and Probability	Due: Reading Journal Entry 4 and 5

12/1	Unit Plan Presentations Preparing for the journey ahead: What are your learning goals for student teaching? What can you do to prepare yourself for student teaching? Student Teaching Certificates	Due: Reading Journal Reflection Final Unit Plan Taskstream Assessments Third Field Reflection Student Teaching Syllabus Pre-Student teaching forms
12/8	Final meeting	Due: NCTM Content Portfolio

Course Evaluation

To determine grades for EDC 430, I will use scoring rubrics specifically designed for each assignment and task. Please note that up to 20% of assignment points may be deducted for poor grammar, spelling, and punctuation unless otherwise noted in the assignment. The following grading system is used to determine letter grades For EDC 430 and for MTH 391:

Grade	Points earned
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C -	70-72
D	65-69
F	64 and lower

Grades for EDC 431 are Satisfactory (S) or Unsatisfactory (U) and determined by the university supervisor's assessment of the following: evidence of 40 hours of successful supervised practicum (with signed documentation from cooperating teacher(s)), successful implementation of lesson plans and other practicum responsibilities, and the designation "recommended for student teaching" from the university supervisor and cooperating teacher(s).

Appendix A: RIPTS and NCTM standards below are the standards that will be applied to YOU, the mathematics teacher candidate.

THE RHODE ISLAND PROFESSIONAL TEACHING STANDARDS (RIPTS)

Standard 1: Teachers create learning experiences using a broad base of general knowledge that reflects an understanding of the nature of the communities and world in which we live.

Teachers...

- 1.1 reflect a variety of academic, social, and cultural experiences in their teaching
- 1.2 use a broad content knowledge base sufficient to create interdisciplinary learning experiences designed to ensure that all students achieve state standards for content and achievement
- 1.3 exhibit a commitment to learning about the changes in their disciplines and in our world that models a commitment to lifelong learning for students
- 1.4 facilitate student involvement in the school and wider communities

Standard 2: Teachers have a deep content knowledge base sufficient to create learning experiences that reflect an understanding of central concepts, vocabulary, structures, and tools of inquiry of the disciplines/content areas they teach.

Teachers...

- 2.1 know their discipline/content areas and understand how knowledge in their discipline/content area is created, organized, linked to other disciplines, and applied beyond the school setting
- 2.2 design instruction that addresses the core skills, concepts, and ideas of the disciplines/ content areas to help all students meet Rhode Island's learning standards
- 2.3 select appropriate instructional materials and resources (including technological resources) based on their comprehensiveness, accuracy, and usefulness for representing particular ideas and concepts in the discipline/content areas
- 2.4 engage students in a variety of explanations and multiple representations of concepts, including analogies, metaphors, experiments, demonstrations, and illustrations, that help all students develop conceptual understanding
- 2.5 represent and use differing viewpoints, theories, and methods of inquiry when teaching concepts and encourage all students to see, question, and interpret concepts from a variety of perspectives

Standard 3: Teachers create instructional opportunities that reflect an understanding of how children learn and develop.

Teachers...

- 3.1 understand how students use their prior knowledge to construct knowledge, acquire skills, develop habits of mind, and acquire positive dispositions toward learning
- 3.2 design instruction that meets the current cognitive, social and personal needs of their students
- 3.3 create age-appropriate lessons and activities that meet the variety of developmental levels of students within a class

Standard 4: Teachers create instructional opportunities that reflect a respect for the diversity of learners and an understanding of how students differ in their approaches to learning.

Teachers...

- 4.1 design instruction that accommodates individual differences (e.g., stage of development, learning style, English language acquisition, cultural background, learning disability) in approaches to learning
- 4.2 use their understanding of students (e.g., individual interests, prior learning, cultural background, native language, and experiences) to create connections between the subject matter and student experiences
- 4.3 seek information about the impact of students' specific challenges to learning or disabilities on classroom performance, and work with specialists to develop alternative instructional strategies to meet the needs of these students where appropriate
- 4.4 make appropriate accommodations and modifications for individual students who have identified learning differences or needs in an Individualized Educational Plan (IEP), 504 Accommodation Plan, Personal Literacy Plans (PLP's), or other approved school-based individualized learning plans (ILP's)

Standard 5: Teachers create instructional opportunities to encourage all students' development of critical thinking, problem solving, performance skills, and literacy across content areas.

Teachers...

- 5.1 design lessons that extend beyond factual recall and challenge students to develop higher level cognitive skills
- 5.2 pose questions that encourage students to view, analyze, and interpret ideas from multiple perspectives
- 5.3 make instructional decisions about when to provide information, when to clarify, when to pose a question, and when to let a student struggle to try to solve a problem
- 5.4 engage students in generating knowledge, testing hypotheses, and exploring methods of inquiry and standards of

evidence

5.5 use tasks that engage students in exploration, discovery, and hands-on activities

Standard 6: Teachers create a supportive learning environment that encourages appropriate standards of behavior, positive social interaction, active engagement in learning, and self-motivation.

Teachers...

6.1 use principles of effective classroom management to establish classrooms in which clear rules and standards of behavior are maintained

6.2 establish a safe, secure, and nurturing learning environment that supports the active engagement of all students

6.3 provide and structure the time necessary to explore important concepts and ideas

6.4 help students establish a classroom environment characterized by mutual respect and intellectual risk-taking

6.5 create learning groups in which all students learn to work collaboratively and independently

6.6 communicate clear expectations for achievement that allow all students to take responsibility and advocate for their own learning

Standard 7: Teachers work collaboratively with all school personnel, families and the broader community to create a professional learning community and environment that supports the improvement of teaching, learning and student achievement.

Teachers...

7.1 work collaboratively with colleagues to examine teacher practice, student work and student assessment results with the goal of improving instruction and achievement

7.2 develop relationships with students and their families to support learning

7.3 understand the role of community agencies in supporting schools and work collaboratively with them as appropriate

Standard 8: Teachers use effective communication as the vehicle through which students explore, conjecture, discuss, and investigate new ideas.

Teachers...

8.1 use a variety of communication strategies (e.g., listening, restating ideas, questioning, offering, counter examples) to engage students in learning

8.2 use a variety of modes of communication (e.g., verbal, visual, kinesthetic) to promote student learning

8.3 use technological advances in communication, including electronic means of collecting and sharing information, to enrich discourse in the classroom and the school

8.4 emphasize oral and written communication through the instructional use of discussion, listening and responding to the ideas of others and group interaction

8.5 seek knowledge of and demonstrate sensitivity to the particular communication needs of all students

Standard 9: Teachers use appropriate formal and informal assessment strategies with individuals and groups of students to determine the impact of instruction on learning, to provide feedback, and to plan future instruction.

Teachers...

9.1 select and/or design individual and group classroom assessments based on the strengths, limitations, and data provided by the assessments

9.2 identify and consider student and contextual variables that may influence performance so that a student's performance can be validly interpreted

9.3 systematically collect, synthesize, and interpret assessment results from multiple assessments to monitor, improve, and report individual and group achievement

9.4 provide students with opportunities and guidance to evaluate their own work and behavior against defined criteria and use the results of self-assessment to establish individual goals for learning

9.5 use assessment results to provide students with timely, helpful, and accurate feedback on their progress toward achievement goals

9.6 maintain records of student learning and communicate student progress to students, parents/ guardians, and other colleagues

9.7 use information from their assessment of students to reflect on their own teaching, to modify their instruction and to help establish professional development goals

Standard 10: Teachers reflect on their practice and assume responsibility for their own professional development by actively seeking and participating in opportunities to learn and grow as professionals.

Teachers...

10.1 solicit feedback from students, families, and colleagues to reflect on and improve their own teaching

10.2 explore and evaluate the application of current research, instructional approaches and strategies, including

technologies to improve student learning

10.3 take responsibility for their own professional development and improvement of their students' learning by participating in workshops, courses, or other individual and collaborative professional development activities that support their plans for continued development as teachers

10.4 take responsibility for learning about and implementing federal, state, district and school initiatives to improve teaching and learning

Standard 11: Teachers maintain professional standards guided by legal and ethical principles.

Teachers...

11.1 maintain standards that require them to act in the best interests and needs of students

11.2 follow school policy and procedures, respecting the boundaries of their professional responsibilities, when working with students, colleagues, and families

11.3 follow local, state, and federal law pertaining to educational and instructional issues, including regulations related to students', parents'/ guardians', and teachers' rights and responsibilities

11.4 interact with students, colleagues, parents, and others in a professional manner that is fair and equitable

11.5 are guided by codes of professional conduct adopted by their professional organizations

APPENDIX B

NCATE/NCTM Program Standards (2003)

Programs for Initial Preparation of Mathematics Teachers

Standards for Middle Level and Secondary Mathematics Teachers

Process Standards (Standards 1-7)

The process standards are based on the belief that mathematics must be approached as a unified whole. Its concepts, procedures, and intellectual processes are so interrelated that, in a significant sense, its "whole is greater than the sum of the parts." This approach would best be addressed by involvement of the mathematics content, mathematics education, education, and field experience faculty working together in developing the candidates' experiences.

Likewise, the response to the disposition standard will require total faculty input. This standard addresses the candidates' nature and temperament relative to being a mathematician, an instructor, a facilitator of learning, a planner of lessons, a member of a professional community, and a communicator with learners and their families.

Standard 1: Knowledge of Mathematical Problem Solving

Candidates know, understand, and apply the process of mathematical problem solving.

Indicators

1.1 Apply and adapt a variety of appropriate strategies to solve problems.

1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts.

1.3 Build new mathematical knowledge through problem solving.

1.4 Monitor and reflect on the process of mathematical problem solving.

Standard 2: Knowledge of Reasoning and Proof

Candidates reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry.

Indicators

2.1 Recognize reasoning and proof as fundamental aspects of mathematics.

2.2 Make and investigate mathematical conjectures.

2.3 Develop and evaluate mathematical arguments and proofs.

2.4 Select and use various types of reasoning and methods of proof.

Standard 3: Knowledge of Mathematical Communication

Candidates communicate their mathematical thinking orally and in writing to peers, faculty, and others.

Indicators

3.1 Communicate their mathematical thinking coherently and clearly to peers, faculty, and others.

3.2 Use the language of mathematics to express ideas precisely.

3.3 Organize mathematical thinking through communication.

3.4 Analyze and evaluate the mathematical thinking and strategies of others.

Standard 4: Knowledge of Mathematical Connections

Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

Indicators

- 4.1 Recognize and use connections among mathematical ideas.
- 4.2 Recognize and apply mathematics in contexts outside of mathematics.
- 4.3 Demonstrate how mathematical ideas interconnect and build on one another to produce a coherent whole.

Standard 5: Knowledge of Mathematical Representation

Candidates use varied representations of mathematical ideas to support and deepen students' mathematical understanding.

Indicators

- 5.1 Use representations to model and interpret physical, social, and mathematical phenomena.
- 5.2 Create and use representations to organize, record, and communicate mathematical ideas.
- 5.3 Select, apply, and translate among mathematical representations to solve problems.

Standard 6: Knowledge of Technology

Candidates embrace technology as an essential tool for teaching and learning mathematics.

Indicator

- 6.1 Use knowledge of mathematics to select and use appropriate technological tools, such as but not limited to, spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.

Standard 7: Dispositions

Candidates support a positive disposition toward mathematical processes and mathematical learning.

Indicators

- 7.1 Attention to equity
- 7.2 Use of stimulating curricula
- 7.3 Effective teaching
- 7.4 Commitment to learning with understanding
- 7.5 Use of various assessments
- 7.6 Use of various teaching tools including technology

Pedagogy (Standard 8)

In addition to knowing students as learners, mathematics teacher candidates should develop knowledge of and ability to use and evaluate instructional strategies and classroom organizational models, ways to represent mathematical concepts and procedures, instructional materials and resources, ways to promote discourse, and means of assessing student understanding. This section on pedagogy is to address this knowledge and skill.

Standard 8: Knowledge of Mathematics Pedagogy

Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning.

Indicators

- 8.1 Selects, uses, and determines suitability of the wide variety of available mathematics curricula and teaching materials for all students including those with special needs such as the gifted, challenged and speakers of other languages.
- 8.2 Selects and uses appropriate concrete materials for learning mathematics.
- 8.3 Uses multiple strategies, including listening to and understanding the ways students think about mathematics, to assess students' mathematical knowledge.
- 8.4 Plans lessons, units and courses that address appropriate learning goals, including those that address local, state, and national mathematics standards and legislative mandates.
- 8.5 Participates in professional mathematics organizations and uses their print and on-line resources.
- 8.6 Demonstrates knowledge of research results in the teaching and learning of mathematics.
- 8.7 Uses knowledge of different types of instructional strategies in planning mathematics lessons.
- 8.8 Demonstrates the ability to lead classes in mathematical problem solving and in developing in-depth conceptual understanding, and to help students develop and test generalizations.
- 8.9 Develop lessons that use technology's potential for building understanding of mathematical concepts and developing important mathematical ideas.

Secondary Content (Standards 9-15)

Candidates' comfort with, and confidence in, their knowledge of mathematics affects both what they teach and how they teach it. Knowing mathematics includes understanding specific concepts and procedures as well as the process of doing mathematics. That knowledge is the subject of the following standards.

Standard 9: Knowledge of Number and Operation

Candidates demonstrate computational proficiency, including a conceptual understanding of numbers, ways of representing number, relationships among number and number systems, and meanings of operations.

Indicators

- 9.1 Analyze and explain the mathematics that underlies the procedures used for operations involving integers, rational, real, and complex numbers.
- 9.2 Use properties involving number and operations, mental computation, and computational estimation.
- 9.3 Provide equivalent representations of fractions, decimals, and percents.
- 9.4 Create, solve, and apply proportions.
- 9.5 Apply the fundamental ideas of number theory.
- 9.6 Make sense of large and small numbers and use scientific notation.
- 9.7 Compare and contrast properties of numbers and number systems.
- 9.8 Represent, use, and apply complex numbers.
- 9.9 Recognize matrices and vectors as systems that have some of the properties of the real number system.
- 9.10 Demonstrate knowledge of the historical development of number and number systems including contributions from diverse cultures.

Standard 10: Knowledge of Different Perspectives on Algebra

Candidates emphasize relationships among quantities including functions, ways of representing mathematical relationships, and the analysis of change.

Indicators

- 10.1 Analyze patterns, relations, and functions of one and two variables.
- 10.2 Apply fundamental ideas of linear algebra.
- 10.3 Apply the major concepts of abstract algebra to justify algebraic operations and formally analyze algebraic structures.
- 10.4 Use mathematical models to represent and understand quantitative relationships.
- 10.5 Use technological tools to explore algebraic ideas and representations of information and in solving problems.
- 10.6 Demonstrate knowledge of the historical development of algebra including contributions from diverse cultures.

Standard 11: Knowledge of Geometries

Candidates use spatial visualization and geometric modeling to explore and analyze geometric shapes, structures, and their properties.

Indicators

- 11.1 Demonstrate knowledge of core concepts and principles of Euclidean and non- Euclidean geometries in two and three dimensions from both formal and informal perspectives.
- 11.2 Exhibit knowledge of the role of axiomatic systems and proofs in geometry.
- 11.3 Analyze characteristics and relationships of geometric shapes and structures.
- 11.4 Build and manipulate representations of two- and three- dimensional objects and visualize objects from different perspectives.
- 11.5 Specify locations and describe spatial relationships using coordinate geometry, vectors, and other representational systems.
- 11.6 Apply transformations and use symmetry, similarity, and congruence to analyze mathematical situations.
- 11.7 Use concrete models, drawings, and dynamic geometric software to explore geometric ideas and their applications in real-world contexts.
- 11.8 Demonstrate knowledge of the historical development of Euclidean and non- Euclidean geometries including contributions from diverse cultures.

Standard 12: Knowledge of Calculus

Candidates demonstrate a conceptual understanding of limit, continuity, differentiation, and integration and a thorough background in the techniques and application of the calculus.

Indicators

- 12.1 Demonstrate a conceptual understanding of and procedural facility with basic calculus concepts.
- 12.2 Apply concepts of function, geometry, and trigonometry in solving problems involving calculus.
- 12.3 Use the concepts of calculus and mathematical modeling to represent and solve problems taken from real-world contexts.
- 12.4 Use technological tools to explore and represent fundamental concepts of calculus.

12.5 Demonstrate knowledge of the historical development of calculus including contributions from diverse cultures.

Standard 13: Knowledge of Discrete Mathematics

Candidates apply the fundamental ideas of discrete mathematics in the formulation and solution of problems.

Indicators

13.1 Demonstrate knowledge of basic elements of discrete mathematics such as graph theory, recurrence relations, finite difference approaches, linear programming, and combinatorics.

13.2 Apply the fundamental ideas of discrete mathematics in the formulation and solution of problems arising from real-world situations.

13.3 Use technological tools to solve problems involving the use of discrete structures and the application of algorithms.

13.4 Demonstrate knowledge of the historical development of discrete mathematics including contributions from diverse cultures.

Standard 14: Knowledge of Data Analysis, Statistics, and Probability

Candidates demonstrate an understanding of concepts and practices related to data analysis, statistics, and probability.

Indicators

14.1 Design investigations, collect data, and use a variety of ways to display data and interpret data representations that may include bivariate data, conditional probability, and geometric probability.

14.2 Use appropriate methods such as random sampling or random assignment of treatments to estimate population characteristics, test conjectured relationships among variables, and analyze data.

14.3 Use appropriate statistical methods and technological tools to describe shape and analyze spread and center.

14.4 Use statistical inference to draw conclusions from data.

14.5 Identify misuses of statistics and invalid conclusions from probability.

14.6 Draw conclusions involving uncertainty by using hands-on and computer-based simulation for estimating probabilities and gathering data to make inferences and conclusions.

14.7 Determine and interpret confidence intervals.

14.8 Demonstrate knowledge of the historical development of statistics and probability including contributions from diverse cultures.

Standard 15: Knowledge of Measurement

Candidates apply and use measurement concepts and tools.

Indicators

15.1 Recognize the common representations and uses of measurement and choose tools and units for measuring.

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15.2 Apply appropriate techniques, tools, and formulas to determine measurements and their application in a variety of contexts.

15.3 Complete error analysis through determining the reliability of the numbers obtained from measures.

15.4 Demonstrate knowledge of the historical development of measurement and measurement systems including contributions from diverse cultures.

Middle Level and Secondary Field-Based Experiences (Standard 16)

The development of mathematics teacher candidates should include opportunities to examine the nature of mathematics, how it should be taught and how students learn mathematics; observe and analyze a range of approaches to mathematics teaching and learning, focusing on the tasks, discourse, environment and assessment; and work with a diverse range of students individually, in small groups, and in large class settings.

Standard 16: Field-Based Experiences

Candidates complete field-based experiences in mathematics classrooms.

Indicators

16.1 Engage in a sequence of planned opportunities prior to student teaching that includes observing and participating in both middle grades and secondary mathematics classrooms under the supervision of experienced and highly qualified teachers.

16.2 Experience full-time student teaching in both middle grades and secondary mathematics that is supervised by an experienced and highly qualified teacher and a university or college supervisor with middle grades/secondary mathematics teaching experience.

16.3 Demonstrate the ability to increase students' knowledge of mathematics.

Appendix C: Rhode Island Department of Education State Initiatives

All student teacher candidates and interns should familiarize themselves with the Rhode Island state initiatives through these websites.

- New England Common Assessment Program (NECAP)
<http://www.ride.ri.gov/InstructionAssessment/Assessment/NECAPAssessment.aspx>
- Personal Literacy Plans (PLP)
<http://www.ride.ri.gov/InstructionAssessment/Literacy/PersonalLiteracyPlans.aspx>
- Rhode Island Wireless Classroom Initiative
<http://www.ride.ri.gov/FundingFinance/SchoolDistrictFinancialData/WirelessClassroomInitiative.aspx>
- Rhode Island's High School Regulations
<http://www.ride.ri.gov/Portals/0/Uploads/Documents/Diploma-System/Guidance-Final-2011.pdf>
- Individualized Education Plan (IEP)
<http://www.ride.ri.gov/StudentsFamilies/SpecialEducation/IEPIndividualEducationProgram.aspx>
- Response to Intervention
<http://www.ride.ri.gov/InstructionAssessment/InstructionalResources/ResponseToIntervention.aspx>
- RITAP
<http://www.ritap.org/iep/what-is-an-iep>
- Professional Development
<http://www.ride.ri.gov/TeachersAdministrators/ProfessionalDevelopment.aspx>
- Student Learning Objectives (SLO)
<http://www.ride.ri.gov/Portals/0/Uploads/Documents/Teachers-and-Administrators-Excellent-Educators/Educator-Evaluation/Student-Learning-Objectives/Guide-For-Teachers-Writing-Student-Learning-Objectives.pdf>